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December 20, 1994

By Hand

Mr. William Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use (ET Docket No. 94-32)

Dear Mr. Secretary:

On December 19, 1994, Apple Computer, Inc., filed comments in the above-referenced proceeding. Due to a duplication error, one paragraph of text was omitted from the filed copy. A corrected copy is attached hereto, for inclusion in the above-referenced docket.

Questions with respect to this matter should be directed to the undersigned.

Respectfully submitted,

Henry Goldberg
Attorney for
Apple Computer, Inc.

Enclosure

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Allocation of Spectrum Below	)	ET Docket No. 94-32
5 GHz Transferred from	)	
Federal Government Use	)	

To: The Commission

COMMENTS OF APPLE COMPUTER, INC.

Apple Computer, Inc. ("Apple") hereby submits its comments in response to the Federal Communications Commission's (the "FCC" or "Commission") Notice of Proposed Rule Making (the "NPRM") in the above-referenced proceeding. In this proceeding, the FCC will determine how to allocate 50 MHz of spectrum in the 2390-2400 MHz band, the 2402-2417 MHz band, and the 4660-4685 MHz band that has been identified by the Department of Commerce for transfer from Federal Government to private sector use. These comments deal with the allocations for the 2390-2400 MHz and 2402-2417 MHz frequency bands, as well as other existing private sector bands that would be affected by a change in the regulatory status of the reallocated bands.

In summary, Apple urges the Commission to:

- **Allocate the 50 MHz as part of a comprehensive spectrum plan.** By assessing potential uses for the newly-available bands in light of current allocations and policy priorities, the Commission can develop a band plan that maximizes the value of the reallocated spectrum and advances the uses to which existing allocations are placed.

- **Allocate the 2390-2400 MHz band for unlicensed Data-PCS.** The Commission has previously stated its intention to allocate additional spectrum for unlicensed Data-PCS. The 2390-2400 MHz band is uniquely suited to meet the essential requirements of such an allocation and is the only available spectrum that will permit the prompt deployment of Data-PCS. Moreover, such an allocation will protect the existing users of the 2390-2400 MHz band.

- **Retain the existing allocation of the 2402-2417 MHz band and decline to license any new services in that band.** The 2400 MHz ISM band supports important, existing communications applications that cannot

be accommodated elsewhere. Indeed, this band will become even more essential for unlicensed communications services in the coming years in light of the Commission's actions in its AVM proceeding, involving the 902-928 MHz band.

I. THE COMMISSION SHOULD ADOPT A SPECTRUM ALLOCATION THAT REFLECTS A COORDINATED, COHESIVE, AND COMPREHENSIVE PLAN.

In its emerging technologies proceeding, the Commission used a comprehensive approach to clear spectrum for, and allocate spectrum to, a variety of new technologies and services, including PCS. In particular, in finalizing its PCS rules the Commission crafted an allocation plan that has been broadly acclaimed as satisfying the needs of licensed PCS providers (those requiring 30 MHz allocations as well as those planning to provide niche or other lower bandwidth services), MSS system operators, manufacturers and users of unlicensed PCS devices, other existing and future users of the emerging technologies band, and providers and users of communications services operating in other frequency bands.[1]

The emerging technologies/PCS proceeding represented a major step forward in spectrum allocation policy. In this proceeding, Commission abandoned the prior piece-meal approach of allocating chunks of spectrum, one at a time, to particular applications, a process which often forced parties to battle over who had the best claim to a particular piece of radio spectrum. Instead, by considering all needs in tandem, the Commission was able to develop an allocation that maximized spectrum usefulness, avoided unnecessary pitfalls, and best served the public interest. The Commission should seek in this proceeding to replicate this level of success by, again, developing its allocation plan for the reallocated 50 MHz in light of other existing and planned allocations.

In particular, the Commission should develop an allocation plan that builds upon the PCS allocation and other existing allocations, takes into consideration the additional federal spectrum that will be made available in the coming years, and resolves spectrum allocation problems that are now reaching critical points (including those facing amateur radio operators and users of unlicensed devices operating in the ISM bands).

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1 See Memorandum Opinion and Order, GEN Docket No. 90-314, RM-7140, RM-7175, RM-7618, 9 FCC Rcd 5031 (1994).

II. THE COMMISSION SHOULD ALLOCATE THE 2390-2400 MHZ BAND FOR UNLICENSED DATA-PCS.

A. There Is Broad Agreement That the Commission Promptly Should Allocate Additional Suitable Spectrum for Data-PCS.

In 1991, Apple first described its vision of "Data-PCS": a service that would permit users of computers to communicate data locally with other individuals and with wireless modems, printers, LANs, and other devices, free from the constraints and burdens that accompany licensed communications.[2] Since that time, educators, researchers, medical practitioners, business persons, and a variety of others have demonstrated the benefits that will flow from Data-PCS.

The Commission recognized the potential benefits of Data-PCS in its first broadband PCS order, in which it allocated 40 MHz of spectrum for unlicensed voice and data PCS devices, including Data-PCS.[3] In its PCS order on reconsideration, the Commission reduced the unlicensed PCS allocation to 20 MHz in order better to accommodate the needs of licensed PCS entities and potential providers of MSS services.[4] At that time, however, the Commission stated that it was "committed to instituting a further rule making...to meet the long term requirements for unlicensed PCS devices, including those potential unlicensed uses that may not be accommodated readily in the initial 20 MHz allocation." [5]

Congress also has recognized the importance of a prompt, suitable allocation for this new service. Most recently, in the Report accompanying H.R. 4522, the FCC Authorization Act of 1994, the House of Representatives stated:

> The value of a new technology that enables people using portable computers to network data by means of high-capacity radio links will greatly benefit education and business productivity is clear. The Commission...should ensure that the decision to allocate additional spectrum for Data-PCS must be expeditious, in order to allow the U.S. computer industry to continue its worldwide leadership and to make this promising new technology a reality. The allocation of at least another 10 MHz will enable the industry to create new data communications technologies, but only if the spectrum is identified and reallocated quickly

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2 See Apple Petition for Rulemaking, "Data-PCS," RM-7618 (filed January 28, 1991).
3 Second Report and Order, GEN Docket 90-314, 8 FCC Rcd 7700, ¶ 88 (1993).
4 Memorandum Opinion and Order, 9 FCC Rcd 5031, ¶ 84.
5 Id. at ¶ 87.

by the FCC, and the existing users of these frequencies are quickly located to other regions of the radio spectrum.[6]

B. The 2390-2400 MHz Band Is Uniquely Well-Suited for Data-PCS.

The single, overwhelmingly important characteristic for any additional Data-PCS allocation is that the spectrum be capable of being made available nationwide in the very near term. The 2390-2400 MHz band represents the only band that can meet this essential requirement and, thus, that can permit the prompt development of Data-PCS.

This special need of Data-PCS is due to the so-called "last link" problem facing this service. In short, because nomadic Data-PCS devices will cause objectionable interference to incumbent users of the emerging technologies band and, because these devices will operate on an "anytime, anywhere" basis, the first Data-PCS device cannot be deployed until the last microwave user has been relocated, finally and irrevocably, from the unlicensed data (or asynchronous) band — a process that may take more than a decade and cost many millions of dollars.[7] This "last link" problem threatens to impede or even destroy the development of Data-PCS (especially in light of UTAM's decision to employ "segment self-financing"), unless the FCC allocates spectrum to this service that is not encumbered by incompatible incumbent users.[8]

If the Commission has decided that the 2390-2400 MHz band is to be shared with another service, the most compatible sharing partner would be the low-power Part 15 Data-PCS. The scales will be tipped in favor of the amateur operator, who is allowed transmitters up to 1500 watts and there are no restrictions on locations or characteristics of antennas. By contrast, the rules adopted for asynchronous unlicensed Data-PCS,

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6 "Federal Communications Commission Authorization Act of 1994," 103rd Cong., 2d Sess., Report No. 103-844 at 10-11 (October 6, 1994).

7 See, e.g., Second Memorandum Opinion and Order, ET Docket No. 92-9, at ¶ 20 (released December 2, 1994); "UTAM Plan for Financing and Managing 2 GHz Microwave Relocation," GEN Docket No. 90-314 (filed Aug. 1, 1994).

8 See Apple Comments and Reply Comments in response to UTAM Plan, supra n.7. UTAM, Inc. has been given conditional authority to manage the transition of the 2 GHz unlicensed PCS band. UTAM's segment self-financing plan would require manufacturers of Data-PCS devices to fund the clearing of the unlicensed data band on their own and in advance of any meaningful product deployment, rather than using revenues from unlicensed voice PCS products (many of which can be frequency coordinated and, therefore, can be deployed in advance of total band clearing) to fund clearing the unlicensed data band.

limit emissions to well under a watt. [9] Additionally, the spectrum etiquette imposed on the Data-PCS device requires a modified "listen before talk" deferral to a band occupant. Representatives of the amateur service and Data-PCS providers should also seek an informal "band plan" that would further minimize interference conditions.

Compared with the sporadic cacophony of the nearby "ISM band" or the daunting task of clearing hundreds of microwave stations from the 1910-1920 band without first being able to deploy products, the prospect of sharing a band with the amateur service is much more attractive.[10]

With the withdrawal of Federal users from this band, the sole remaining occupant will be the amateur service. Accordingly, this allocation would permit the immediate deployment of Data-PCS devices.

Other potentially available bands are either so burdened with existing users or so expensive to clear that they are not viable for Data-PCS. As discussed extensively in Apple's comments in the PCS proceeding, the number of incumbent users made the 1900-1910 MHz band initially allocated for Data-PCS virtually unusable for this service and, therefore, Apple and others supported the Commission's decision to withdraw this portion of the unlicensed PCS allocation. More recently, representatives of the computer industry, with Commission encouragement, have attempted to reach agreement with users of certain other bands near the existing unlicensed PCS allocation, under which the incumbent users would agree to relocate in return for a reasonable accommodation by Apple and other computer manufacturers. Unfortunately, however, these efforts have been unsuccessful.

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[9] See §15.319(c), (d) and (e). Peak transmit power is limited to 100 microwatts multiplied by the square root of the emission bandwidth in hertz. For example, a 100 kHz data signal would be permitted 32 mW, a 1 MHz signal 100 mW, and a 10 MHz signal 316 mW output.

[10] The 2390-2400 MHz band is not without its own ISM interference problems. Motorola cites Figures E-3 and E-4 of the NTIA's Preliminary Spectrum Allocation Report, concluding that this band may have an ambient noise level within 3 dB of the nearby 2402-2417 MHz band. Motorola Comments on 94-32 at p. 6. For this and related reasons, Motorola suggests that "the 2390-2400 MHz band may . . . be best suited for limited range communications services. " Motorola at p. 12. By those characteristics, Data-PCS should be an acceptable application for this band.

C. The Commission Should Impose Technical Rules on the 2390-2400 MHz Band That Are Consistent With Those Adopted for the Existing Unlicensed Data PCS Band.

In most respects, the technical rules that will govern operations in the 1910-1920 MHz unlicensed data PCS band (*i.e.*, the Part 15 rules governing asynchronous unlicensed PCS operations) should also govern devices operating in the 2390-2400 MHz band. As a result, the Commission should amend Sections 15.301, 15.303(g), 15.319(a), and 15.321 to include a reference to the 2390-2400 MHz band.[11]

There is, however, one critical respect in which the rules for the 2390-2400 MHz band should be modified: because there are no incumbent users that must be relocated, the portions of the existing rules governing the transition of the 2 GHz band and the operation of "early deployed" coordinatable devices should not apply in the new band. The Commission therefore should not amend Sections 15.307 (coordination procedures and assurances) and 15.311 (labeling) to refer to the 2390-2400 MHz band.[12]

On a related matter, while certain manufacturers may be able to benefit from the fact that the 2390-2400 MHz band will be located adjacent to the 2400 MHz ISM band, these bands should operate separately and devices operating in one band should not be permitted to "bleed over" into the other band or straddle the band edge.

D. The Additional Allocation Will Augment, But Will Not Replace, the Existing Allocation for Unlicensed Data PCS.

As the Commission recognized in its PCS orders, interested parties have demonstrated the need for a 20 MHz allocation for unlicensed data PCS. Accordingly, the Commission should allocate the 2390-2400 MHz band in addition to, and not in lieu of, the existing 1910-1920 MHz allocation.

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11 Because this band will be used solely for asynchronous operations, a reference to the 2390-2400 MHz band should not be added to Section 15.323 (isochronous operations).

12 For this reason, UTAM should not be given responsibilty for clearing the 2390-2400 MHz band or for coordinating early deployment in this band. In particular, because UTAM has adopted a "segment self-financing" approach, devices sold for operation in the 2390-2400 MHz band should not be forced to subsidize UTAM's general operations (including early deployment operations and clearing of the unlicensed isochronous band). In addition, if the Commission decides that a per-unit fee should be imposed on devices designed to operate in the 2390-2400 MHz band, (i) those fees should be managed separately from UTAM's other fees, preferably by an independent, impartial entity governed by manufacturers of unlicensed asynchronous devices, and (ii) the Commission should expressly permit this entity to waive the per-device fee for certain users, most notably schools, for whom a $20/device charge may be prohibitively expensive.

This combined allocation will create a transition path, in which immediate demand for nomadic devices can be met in the 2390-2400 MHz band, while the 1910-1920 MHz band can be used in the longer term for nomadic devices and in the immediate term if there is any demand for coordinatable data devices. In addition, the existing allocation will support the operation of multi-function devices that will operate in conjunction with unlicensed voice devices and/or licensed PCS devices, and may enable manufacturers to take advantage of lower-cost components developed for the nearby licensed PCS bands.

III. THE COMMISSION SHOULD REJECT ALTERNATIVE PROPOSALS FOR THE 2390-2400 MHZ BAND.

In the NPRM, the Commission requests comments on an allocation approach that would designate the three reallocated bands for general Fixed and Mobile services, relying on market forces — and, in many cases, auctions — to determine the exact services that would be provided in this spectrum.

Apple strongly opposes this proposed allocation for the 2390-2400 MHz band. First, as discussed above, this band represents the only spectrum that can make Data-PCS a reality. The Commission should not squander this valuable asset on undefined, unspecified services. This is particularly true in light of the recent allocation to PCS (which has been defined broadly to permit a wide range of mobile and ancillary fixed services) and the remaining spectrum in the emerging technologies band that could be available for new services where required.

In addition, such an allocation could undermine the Commission's efforts to increase opportunities for designated entities. An unlicensed allocation would contribute significantly to the goal of open entry: by definition, an unlicensed allocation would permit any entity, of any size or ownership structure, to enter the market for unlicensed Data-PCS devices. That entry opportunity, moreover, would not expire when the relevant licenses have been auctioned, but rather would continue in the years to come.

Finally, Apple questions whether such an allocation would place the spectrum at its best and most valued use and provide the greatest benefit to the public.[13] Such an allocation could easily result in a patchwork of non-complimentary services and, for

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[13] NPRM at ¶ 8.

example, would make it difficult for service providers to arrange for geographic roaming and nationwide coverage, both of which are often of significant value to users.

Apple also opposes the alternative allocations suggested in the NPRM, including an allocation for wireless local loops, IVHS, rural interactive video services, low power communications, MSS, and advanced private communications. As the Commission observed, most of these uses are already accommodated and, in any event, in none of these cases does the 2390-2400 MHz band represent the sort of unique, singular opportunity as it does for Data-PCS.

IV. THE COMMISSION SHOULD NOT AUCTION THE 2402-2417 MHZ BAND OR LICENSE ANY NEW SERVICES IN THAT BAND.

The record assembled in this proceeding to date is overwhelming in its support for retaining the existing ISM band at 2402-2417 MHz. The growing range of unlicensed operations in the existing ISM bands is quite impressive. Utilization of the 2400 MHz band will likely grow substantially when an industry interoperability standard is finalized[14] and if AVM devices are deployed in the 902-928 MHz ISM band, as now appears likely.[15] The Commission should seek to accommodate demand for these devices with increasing spectrum resources, not by reallocating the 2400 MHz ISM band to alternative, and likely incompatible, uses.

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[14] See Comments in the instant Docket of IEEE 802 (filed December 19, 1994).

[15] The possible impairment of the 902-928 MHz Part 15/ISM band by licensed AVM/MLS purveyors will reduce the amount of spectrum available for unlicensed applications and accelerate the migration of users from the 900 MHz ISM band to the 2400 MHz ISM band. See Comments of Southern California Repeater and Remote Base Association (SCRRBA), PR Docket No. 93-61, at 3 ("[T]he 902-928 MHz band is essentially unusable due to the severe susceptibility to interference of Pacific Teletrac's "Automatic Vehicle Monitoring" system") and 9 ("The experience described above with Pacific Teletrac on the 902-928 MHz band is a typical example of how such sharing will NOT work"); Comments of the American Radio Relay League (ARRL), PR Docket No. 93-61, at page 19 (" What must be avoided, however, is a situation in which amateurs are relegated to secondary status, while new users, especially land mobile users, are given primary status in the band. That situation occurred in the 902-928 MHz band in some areas of the country, when AVM systems were developed. Amateurs were simply told by the AVM "newcomer" to cease operation in the entire band, in favor of the primary user. ")

In addition, there is every prospect of yet another interference-contributing source in the 2400 MHz band: microwave lighting. High power lighting devices that use magnetrons show similar μwave characteristics to ovens; that is, they nominally are centered in the ISM band and occupy tens of MHz instantaneously and more during longer periods, and as they age, they tend to drift lower in frequency and emit more signals into their surroundings. The deployment of these devices will require greater ISM/Part 15 spectrum to enable communications devices to avoid these additional interference sources.

Apple will not attempt to repeat or duplicate the information regarding the adverse effects of reallocating the 2400 MHz ISM band that has previously been filed with the Commission and that likely will be filed in response to this NPRM, as the case has been made effectively and thoroughly. Apple will, however, joint these other parties in reiterating that the FCC should take its own counsel, that of the NTIA, and the nearly unanimous verdict of industry, and reaffirm its commitment to the existing allocation of this band.

V. THE COMMISSION SHOULD MAKE PERMANENT THE PRESENT RULES AND STATUS OF THE AMATEUR SERVICE IN THE 2300-2310 AND 2390-2400 MHZ BANDS.

As discussed above, the 2390-2400 MHz band is currently allocated only for the amateur service, a status that the Commission is calling into question in the NPRM. Similarly, the next increment of spectrum to be turned over for the private sector by January 1, 1996, is expected to include the 2300-2310 MHz amateur-only band. Both of these bands, as well as the 2400-2450 MHz band, are considered parts of the "13 cm" bands.

Each of these bands, and others in the amateur service, are essential components of a set of band segments extending through much of the radio spectrum. Each amateur band has certain characteristic attributes, in permitted signaling, in available bandwidths and in propagation, that allow hams to experiment, develop and use it appropriately for those band-specific attributes. Any change in status of one band can affect other amateur bands. In the past, the Commission has made allocation decisions affecting a single amateur band without addressing these secondary effects, resulting in an overall pattern of diminishing the spectrum available for the amateur service.

The 2300--2310 and 2390-2400 MHz bands could be a case in point, but the Commission can and should act otherwise in conjunction with the present proceeding.[16]

To allay the fears of the amateur committee, to provide for further amateur activities, and to forestall repetition of the current process whereby many parties contend for the amateur spectrum, the Commission should make a package of coordinated decisions now, including:

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16 Southwestern Bell Corporation has asked the Commission to allocate both the 2300-2310 and 2390-2400 MHz segments for wireless local loops. This request should be rejected out of hand because of the damage that would be done to the amateur service.

- Retain the present allocation of the entire 2390-2450 MHz band to the amateur service, affirming that no primary services will be licensed, auctioned or otherwise, in the 2400-2483.5 MHz band;

- Increase that allocation to extend over the balance of the Part 15 band at 2450-2483.5 MHz, with the full understanding by all parties that this increased allocation is only applicable domestically and thus is not suitable for satellite-based systems;

- As discussed above, allocate the 2390-2400 MHz band to the "most compatible sharing partner" among the band contenders,[17] which would clearly be low power Part 15 Data-PCS services, secondary to the amateur service; and

- Declare that the 2300-2310 MHz band will maintain an amateur-exclusive status and will not be considered for reallocation after the band is released by the Federal Government.[18]

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[17] See Comments of The Radio Amateur Satellite Corporation ("AMSAT") at p 15.

[18] The amateur community has stressed, among other things, the valuable research using low power signals near 2304 MHz.

CONCLUSION

For the reasons stated above, Apple respectfully requests that the Commission take the actions discussed herein.

Respectfully submitted,

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